

## **The Liquidity of the Bucharest Stock Exchange (BSE) during the Financial Crisis<sup>(\*)</sup>**

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**Abstract.** *The paper presents the evolution of BSE during the financial crisis in 2008.*

*The investors' preferences for blue chips shares remained unchanged, there were traded the same shares in almost the same volumes. The shares' prices are highly positive correlated, the reduce liquidity of BSE determine the investors' preferences for liquid shares.*

*The crisis determined a decrease in the transactions volume and value and in the number of shares traded, with major impact over the shares' prices, possible due to emotion reaction of investors.*

*BSE is still attractive, having low prices and high future possibility of increasing.*

**Keywords:** financial crisis; stock exchange evolution; stock exchange liquidity; Bucharest Stock Exchange evolution; correlation between shares.

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## Introduction

The financial crisis started in 2008 has a large impact over the evolution of countries and global economies, including stock exchanges. The impact over the stock exchanges reflected visible on the risk assumed by investors, on reduction of savings and investments attraction and opportunities, on decrease of transactions values and volumes.

For start, the paper presents briefly the position of BSE on Romanian capital market, determining that it represents more than 85% of the capital market. Within the BSE there are several composing markets. The majority of transactions on BSE are realized on shares market. For a better resuming of BSE shares market evolution, the paper presents the BSE indexes and the shares weights that form the indexes composition.

Then, there are identified the shares that have an impact over the BSE transaction value. The trading activity on BSE is based on just 16 shares that are constant and permanently traded. The transactions made with this few shares cover most of the BSE transaction value, sustaining the observation of BSE reduce liquidity (Dragota and et al., 2009). There are also presented characteristics of the Romanian capital market and investor that may partial explain the specific capital market transactions volumes and investor behavior.

From this analysis of covariance and the correlation between shares' prices and BSE indexes, there can be concluded that the 16 shares are positive correlated between them and with BSE indexes. BSE is still a young market, with considerable influence between shares' prices evolution.

The study presents the evolution of BSE capitalization and BSE indexes over the last years, concluding that the investors' preferences for the few shares remain unchanged from crisis beginning.

The conclusion of the paper is that investors are attracted by BSE, which have reduced prices for shares and high possibility of increasing in near future (Dragota and Serbanescu, 2010) regarding the investors interest for IPO investments. From the beginning of financial crisis, the number and value of trades and number of shares traded reduce, downward trend had been manifested mostly on shares' prices based partial on an emotional reaction of investors.

## The Romanian stock exchanges – a briefly overview

The capital market in Romania has just started to function after a long period of prohibition, as part of a large area of emerging markets in the Eastern Europe, developed after the falling of communist regime. The Romanian capital

market is formed from two separate stock exchanges, one in Bucharest and one in Sibiu, each of them with different support assets to trade.

The Sibiu stock exchange trades derivatives, futures, options and contracts for difference that have as underlying assets shares trade on Bucharest Stock Exchange (BSE), currencies, interests rates, stock exchange indexes and commodities.

The Bucharest Stock Exchange (BSE – the translation in English, BVB is the abbreviation of the Romanian name) has as trading assets shares of large companies of various activity domains of economy, corporate and cities bonds, funds units and future contracts. The BSE is organized on two axes: BSE and Rasdaq. On BSE there are traded shares of large Romanian companies that fulfill all BSE standards for quotation and also corporate and cities bonds, financial funds units and future contracts.

From analyzing the stock exchange trades there can be seen that not all assets traded have the same influence over the capital market transactions value. There are assets that are more traded than others, so that their variation of price induces a more important variation in index value. On the other hand, there are assets that are not traded over a shorter or longer period of time, so their impact over the stock exchange index value is reduced.

For instance, if we consider the transactions made on BSE and Rasdaq over last years, the majority of the transactions were realized with shares. We can see that the shares market is more that 90%, sometimes even 100% of the total BSE transaction market value. The bond market on BSE varies from 1% to 4% to 10%, with a pick of 18% in 2009, probably based on the short-term emotional reaction of investors on the beginning of financial crisis to move their investments to a more stable area with a lower risk – bonds. Transactions with futures contracts and funds units on BSE are less that 1% (see Appendix 1 and Appendix 2).

Some of the reasons that determine the emotional reaction of inexperienced investors, under new and adverse information impact, are mentioned by Dragota and Serbanescu (2010): lack of interest from the investors towards the use of invested funds, mental demarcation between real economy and financial investments, investors' lack of interest for control. These non-rational investing reasons are not specific only to young and immature markets as the Romanian capital market, but are also manifested in mature and stable western financial and economic decisions, being couple of the reasons that induce the financial crisis.

Dragota and Serbanescu (2010) and Dragota et al. (2009) mention some other aspects specific to the Romanian financial market: unpleasant experiences in which the involvement of authorities has often been ambiguous, the manner

the investors are able to understand the available information, the capacity of investors to make a proper asset valuation (Dragota, Mitrica, 2004).

The low experience of Romanian investors regarding the investments and some other aspects of the national capital market are reflected in scientific studies: in the investment decision investors look for incomes resulted from positive variations of the stock prices on short periods, the sources of information are balance sheets, articles and news in specialized news papers, TV and internet and daily stocks' prices. Their studies also mention the orientation of majority of investors towards investments with high returns and high liquidity, the third criteria in investment decision being the assets' volatility – this may also be a result of the Romanian capital market characteristic, which bases it's transactions on few shares. Studies questioned the long-term horizon of the Romanian investors, but gather proves about the lack of interest for shares' dividends and an increased interest for speculation of shares' prices.

Other studies, such as the one presented by Prognosis.ro, present the Romanian investor as a young person, that graduated the university studies (usually economic studies), with just a few years of experience of trading on the Bucharest stock exchange, working in financial – banking domain, making decision on personal analyses of the market but considering the brokers' advise – so, the lack of experience is also doubled by low capacity of accessing and analyzing all data available in the market and sometimes by uncertain information sources, having a strong confidence in their capability due to the personal abilities, university studies followed and working domain.

In the next part of the paper, we shall study the share market on BSE in order to determine if there are assets with more or less liquidity and influence over the market transactions value.

### **The share market on BSE**

The shares market on BSE is formed from four tiers, first tier with 21 companies, second tier with 47 companies listed, third tier with one company and international tier with one company listed. The difference between the tiers is made by the specific, restrictive conditions that the companies must fulfill, but all companies listed on BSE must accomplish some general conditions.

To see how companies' shares dispute the market transaction value, we shall take the daily activity on BSE for six month – 128 quotation days. For the start, we shall consider the activity on BSE by three criteria – number of trades for a share, number of shares traded from each asset, total value of transactions for each share.

From the total of 70 companies listed on BSE, the first four, counted after their transactions value, detain 50% of the total transactions value on BSE. 3/4 of the total transactions value on BSE is spread between eight shares, seven of which are financial institutions – the five SIFs and two banks, and one is a company in the energetic field. If we go farther more, to 85% of the total transactions value, there will be added another three companies – two in the energetic field and another bank – the only share in the international tier of the BSE quota. 96% of the total BSE traded value is split between 22 companies, so between 85% to 96% there are added 11 more companies, including activity fields as financial – 2 companies, pharmaceutical – 3, energy – 1, communications – 2, industry – 3 companies (see Appendix 3).

On a daily base situation, from 128 transactional days, only 10 shares have in each day more then 0.5% of the total BSE transactions value – shares included in the initial list of 22. Other 4 shares have more than 0.5% in over 100 days. The 22 initial shares cover around 94% to 98% of the total daily BSE transactions value.

A daily data situation of transaction value is influenced by shares that are traded with a reduce frequency. Which is the situation if we consider a weekly base for data computation? What about over a monthly base?

From weekly data, there are 13 of the initial 22 shares that have each week more then 1% of the total weekly BSE transactions value – covering between 75% and 95% of the total BSE transaction value of the week. Other 9 shares, included in the initial list of 22 shares, have more than 0.5% in six to twenty-three from the total of twenty-five weeks – see Appendix 5.

If we look on monthly data situation of transactions value, only 10 shares have in every month more than 2% – they cover between 75% and 92% of the total monthly BSE transaction value and are included in the initial list of 22 shares. Another 15 shares (including the rest of 12 shares from the above list of 22 shares) have each between 0.5% and 3.85% of the total monthly BSE transaction value in one or more of the months in discussion – see Appendix 4.

From the daily, weekly and monthly computation of information, we see that the initial list of 22 shares includes the main shares with transactions on market, with a focus on 10-16 of them.

On short period of time there are some shares that fulfill the condition of having more than 0.5% of the total BSE transactions value for the period, but they did not fulfill the condition for a large period of time. This will induce an increase in volatility when the calculation period is reduced toward daily data and increase stability when the period is enlarging to monthly data. So, on short-term more shares influence the total transactions value of BSE then on long-term, but there is a small and stabile group of shares that have a dominant

influence over the total transactions value of BSE no matter the way we consider the period.

Based on the above information, the 16 shares with influence over BSE transactions volumes and values are:

Table 1

**Most significant 16 shares traded on BSE**

SIF5	SIF2	SIF1	SIF3	SIF4	BRD	TLV	EBS
SNP	BIO	RRC	BRK	TGN	DAFR	AZO	TEL

**Covariance and correlation between shares' prices variation**

The correlation and the covariance of shares' prices variation on daily data reflect the relation of determination that exists between shares' price.

The correlation between shares' price variation is important on a market with reduce liquidity and lack of experience as the Romanian market is. If between shares prices is a connection, it means that one share's price evolution influence other shares' prices evolution. In this case, the market is not efficient, the shares' prices are not determined only on companies results but have a large influence from other shares' evolution – it may be a emotional reactions of the investors with little experience on an young market and also a low information of investors regarding the normal capital market evolution.

In Appendix 6 and Appendix 7 there are presented the correlation and the covariance between the 16 shares' prices evolution. There is a high correlation between financial companies. The most powerful correlation is between the five SIFs, followed be correlation of SIFs with BRD and EBS. Those seven companies are all from the financial-bank domain and represent 65% of the BSE transactions value.

High levels of correlation are also between the seven financial companies and two companies from the energetic sector – DAFR and TGN (correlation coefficients between 0.5 and 0.6), one company in pharmaceutical field – BIO and another financial company – BRK (correlation coefficients around 0.5).

In total, more than 80% of the entire transaction value of BSE is formed from shares that are correlated – movement in one share's price determines movement in the other share's price. An explanation may reside in the lack of experience of Romanian investors that trade under emotional influence, the reduce liquidity of the market, few investment possibilities available on the market, the investors wish to be “in the trend” with the rest of the investors and fear of adverse decisions.

## BSE Indexes

The next question is: does the evolution of the 16 shares reflect the evolution of the BSE – share market? In order to answer to this question, we have to briefly study the BSE indexes.

The BSE most representative indexes are:

- BET – evolution of the most liquid 10 shares, except SIFs and EBS
- BET-XT – evolution of the most liquid 25 shares, except EBS
- ROTX – evolution of blue-chips shares, except SIFs, including EBS (International tier of BSE)
- BET-C – evolution of the shares in I and II tiers of BSE, except SIFs and EBS
- BET-FI – evolution of the 5 SIFs.

The weight of each share in an index is adjusted according to the “free-float” (traded number of shares except that owned by significant share-solders over the total number of shares), so that shares less liquid to have a reduce influence over the index value.

In the table beneath there are presented the five index and the weight of each of the 16 shares within each index.

Table 2

**BSE Indexes composition**

<u>Index Share</u>	BET	BET-XT	ROTX	BET-C	BET-FI
SIF5		6.66			22.57
SIF2		5.31			18.02
SIF1		5.62			19.05
SIF3		6.7			22.72
SIF4		5.2			17.63
BRD	19.46	14.61	19.05	19.62	
TLV	19.99	15.22	25.39	11.41	
EBS			15.24		
SNP	19.29	14.8	16.42	19.82	
BIO	5.2	1.95	2.54	1.1	
RRC	16.02	6.01	7.84	6.76	
BRK	1.39	0.52		0.29	
TGN	11	4.13	5.38	9.29	
DAFR	1.17	0.44		0.49	
AZO	0.89	0.33	0.44	0.75	
TEL	5.6	2.1	2.74	4.73	
Total of 16 shares	100%	89.6%	95.04%	74.26%	100%

It can be seen that no one of the indexes does include all shares. BET-XT is the most complex index of all, but it excludes the EBS, which has around 4% of the transactions value traded on BSE. The situation of EBS on BSE is different from the other shares because: is the single share included in the International Tier and the price of one share is 100 times higher than the majority of the shares (20 times higher than BRD and 50 times higher than TLV – other banks quoted on BSE and around 100-150 times higher than the 5 SIFs).

In a liquid market the fact that there is no index to reflect the evolution of the entire market could be a problem, but BSE has transactions only on few shares, the rest of the shares traded having very reduced transaction values, as presented on the previous part of the paper. The indexes reproduce the lack of liquidity manifested on BSE share market.

### **Covariance and correlation of shares' prices and indexes**

The correlation between shares' prices evolution and BSE indexes evolution has registered high values – as seen in appendix 8. That is a normal situation, indexes being formed based on shares' prices evolutions on various weights.

The correlation between indexes evolution register high values, almost equal to 1 due to the fact that indexes base their evolution on the same shares' evolution, even if each of them have some specific shares included and different weights for each one of the shares.

High levels of correlations are normal between SIFs and BET-FI (correlation coefficients above 0.85), and sustained by the correlation between SIFs prices; BET-FI being a specific index of the 5 SIFs market. A high level of correlation of BET-FI is registered also with BRD, EBS, TGN and BRK – the largest companies in the bank, financial and energetic sectors. The high level of correlation between BET-FI and the four shares indicate the correlation between these shares and the five SIFs.

The correlation between BET-FI and the rest of four BSE indexes is a little lower (correlation coefficients have values above 0.75) than the correlation of the four BSE indexes between them (correlation coefficients have values between 0.8 and almost 1). This situation is explained by the fact that BET-FI is a specific market index, and shares included in its' composition are not present in the rest of BSE indexes, except BET-XT.

The correlation of BET-FI with the rest of four BSE indexes although is a little lower, is higher than 0.75, another evidence that the evolution of shares on BSE is high correlated.



### BSE – capitalization and transaction value

In order to understand the influence of financial crises on the transaction value on BSE we must analyze the evolution of BSE over the period 2004 – 2010. For 2010 data are estimated based data registered on first 29 transaction days.

Number of transactions and number of shares traded decrease with 10% in 2008 compared with 2007, the years with the highest and lowest values around the moment of crises starts, but the number of companies listed in 2008 increase with 15% in the same period – from 59 to 68.

The value of transactions and average daily value reduce to 50% in years after crisis starts in compare with 2007, due to the reduction of shares prices under the influence of financial crisis. The capitalization in 2008 was half of the capitalization on 2007, but in 2009 and 2010 the capitalization regain its value due to the increase in number of companies listed and to the fact that emotional reaction of investors reduce in intensity and market started to recover slowly.

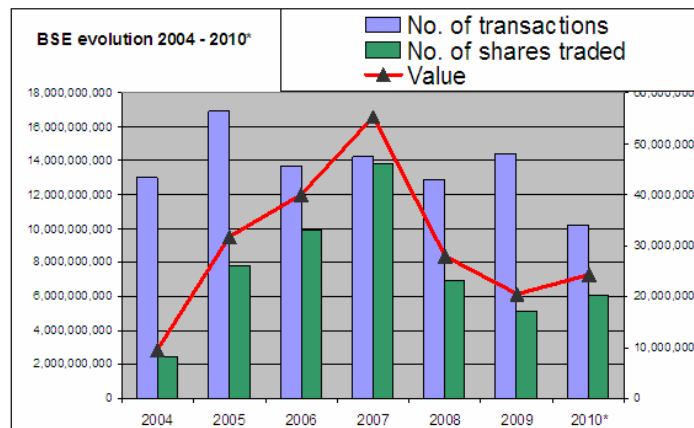


Figure 1. Evolution of BSE volumes

So, the financial crisis did not reduce the appetite of investors for stock exchange transactions, but influence shares' prices, reducing them to half, in condition of increasing the number of companies listed.

Based on this data, the liquidity of BSE market did not reduce after the beginning of financial crisis, the market is still attractive because the prices are low and the slowly increasing evolution in 2009/beginning of 2010 show a great capacity of increasing for future period.

Table 3

BSE capitalization and transaction value						
Year	No. of transactions*	No. of shares traded*	Value*	Average daily value	Capitalization	No of companies listed
2004	644,839	13,007,587,776	2,415,043,850	9,545,628	34,147,400,000	60
2005	1,159,060	16,934,865,957	7,809,734,452	31,618,358	56,065,586,985	64
2006	1,444,398	13,677,505,261	9,894,294,097	39,896,347	73,341,789,546	58
2007	1,544,891	14,234,962,355	13,802,680,644	55,210,723	85,962,389,149	59
2008	1,341,297	12,847,992,164	6,950,399,787	27,801,599	45,701,492,619	68
2009	1,314,526	14,431,359,301	5,092,691,411	20,370,766	80,074,496,090	69
2010*	1,160,500	10,157,317,198	6,072,413,803	24,289,655	83,601,597,233	69

\* estimated values based on first 29 transactional days in year 2010

### BSE Indexes evolution

Before financial crisis starts, the trend of indexes values has an upward evolution. Starting from 2008 the values of BSE indexes decrease dramatically, to value equal to 30% of 2007 value (BET-FI, index of SIFs reduce to 15%).

Starting with 2009 and 2010 the indexes values start to regain slowly, the panic induce in market by financial crisis relaxed and the shares' prices recover slowly.

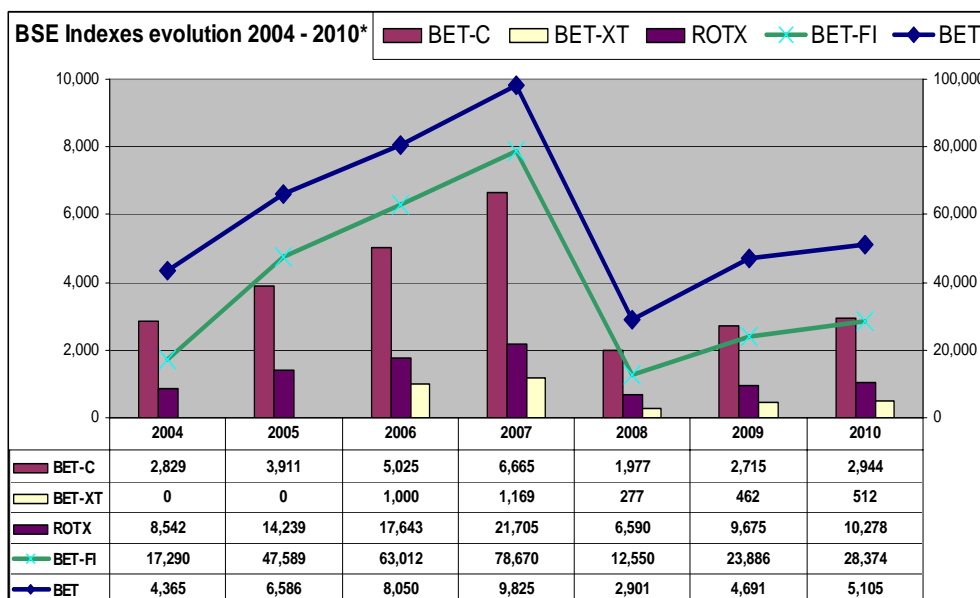


Figure 2. BSE indexes evolution

From the BET-C composition it can be seen that weight of shares in index composition has little change over time, changes due to the index normal recalculation quarterly. Before and after the crisis start, the main shares composing the index are the same, and their weights vary little.

Table 4

	% of BET-C	BRD	SNP	TLV	TGN	ALR	RRC	TEL	Total
Date (Month / Year)	09/2007	19.77	19.63	7.1	--	13.39	4.06	6.31	70.26
	12/2007	19.87	19.61	12.17	--	13.34	5.04	6	76.03
	03/2008	19.75	19.75	11.42	6.86	13.24	4.03	4.93	79.98
	06/2008	19.92	19.9	11.09	7.12	12.02	3.19	5	78.24
	09/2008	19.85	19.62	10.21	7.38	13.12	3.13	4.9	78.21
	12/2008	19.85	19.62	10.21	7.38	13.12	3.13	4.9	78.21
	03/2009	19.75	19.74	7.2	11.81	7.03	4.98	5.9	76.41
	06/2009	19.93	19.65	7.85	11.1	7.42	6.17	5.91	78.03
	09/2009	19.99	19.49	9.03	10.1	8.62	6.39	5.01	78.63
	12/2009	19.85	19.9	11.11	9.33	8.85	6.42	4.82	80.28

So, the weights of shares in market value transaction maintain over time with little change – the financial crisis did not modify the hierarchy of shares involved in transactions and the investors' preferences for shares.

This fact also sustain that investors keep their preferences unchanged over the studied period, continuing to trade the same few blue chips shares.

## Conclusion

The Bucharest Stock Exchange (BSE) is a large and important part of the Romanian capital market and the major part of its activity is formed of trading shares. BSE is formed of two parts – BSE and Rasdaq, but more then 90% of BSE total is represented of BSE itself.

Studying deeply the trades on BSE there can be seen that only 16 shares cover most of the BSE transactions and have a minimum of significance on the transactions on BSE. One of the shares represents more than 20% of the transaction value of BSE, and first four titles have more than half of the BSE transaction value, first eight titles have 75% of the BSE transaction value

The covariance and correlation of the 16 shares reveals a positive and high bound between the 16 shares' prices evolution. As a consequence, the relation between BSE indexes is tight, even if their composition is different.

After the financial crisis starts, the number of transactions and the number of shares traded decrease only a little, the BSE remaining an attractive investment opportunity. Under crisis influence, the shares prices declined rapidly to less than a quarter of the value before crisis, so the investors reacted violently and under emotions. The emotional impact reduced in 2009 and the informational impact of the new situation regarding the financial crisis started to be accepted, so the prices of shares started to raise slowly, the trend being evident to the end of 2009 and start of 2010.

Indexes composition, before and after the financial crisis started, did not change much, only adjustments regarding shares weights were made, as a normal quarterly actualization.

We can conclude that the market remains attractive for the investors and that the investors did not change preferences after the financial crisis beginning. The number of trades and number of shares traded sustain the fact that investors maintain their activity on the market. The significant change induced to the market by the financial crisis is the total value of transaction, which reduced in accordance with prices depreciation.

The study reflects that on the market there were no modification in liquidity over time, but the market remains on the same liquidity level, with majority of the transactions split over a few shares that are highly correlated.

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### Appendix 1 – Value of transactions on the Bucharest Stock Exchange

Year	BSE – shares	BSE – bonds	BSE – futures	Rasdaq – shares	Total	% BSE in Total	% Rasdaq in Total	% Shares in Total	% Bonds in Total	% Futures in Total
1995	250,000				250,000	100	0	100		
1996	1,520,000			348,747	1,868,747	81	19	100		
1997	194,590,000			282,984,354	477,574,354	41	59	100		
1998	184,650,000			378,439,608	563,089,608	33	67	100		
1999	138,915,000			362,079,469	500,994,469	28	72	100		
2000	184,292,000			306,612,753	490,904,753	38	62	100		
2001	381,277,000	481		271,837,776	653,115,257	58	42	100	0	
2002	709,800,000	782,679		421,443,740	1,132,026,419	63	37	100	0	
2003	1,006,271,130	17,135,352		411,048,331	1,434,454,813	71	29	99	1	
2004	2,415,043,850	289,794,852		590,713,133	3,295,551,834	82	18	91	9	
2005	7,809,734,452	127,369,059		1,076,220,509	9,013,324,019	88	12	99	1	
2006	9,894,294,097	985,517,593		847,882,886	11,727,694,576	93	7	92	8	
2007	13,802,680,644	794,335,511	540,535	4,254,076,349	18,851,633,039	77	23	96	4	0.0
2008	6,950,399,787	231,929,951	19,308,628	1,562,001,447	8,763,639,813	82	18	97	3	0.2
2009**	4,231,035,626	1,031,986,759	48,254,811	509,237,815	5,820,515,010	91	9	81	18	0.8
* all values are in RON (local currency)										
** year 2009 is considered January – mid-November 2009										
Source: official site of Bucharest Stock Exchange: <a href="http://www.bvb.ro">www.bvb.ro</a>										

### Appendix 2 – Total value of transactions for the Romanian capital market

Year	Transactions value (RON)							Percentage						
	BSE				BMFMS			BSE				BMFMS		
	Shares	Bonds	Futures	Rasdaq	Futures	Options	Total	Shares	Bonds	Futures	Rasdaq	Futures	Options	
2006	9.894.294.097	985.517.593		847.882.886	9.739.607.803	4.667.902	21.471.970.281	46%	5%	0%	4%	45%	0%	
2007	13.802.680.644	794.335.511	540.535	4.254.076.349	11.688.114.092	5.560.000	30.545.307.131	45%	3%	0%	14%	38%	0%	
2008	6.950.399.787	231.929.951	19.308.628	1.562.001.447	7.557.181.984	5.507.471	16.326.329.268	43%	1%	0%	10%	46%	0%	
2009*	4.231.035.626	1.031.986.759	48.254.811	509.237.815	1.044.050.186	2.314.377	6.866.879.573	62%	15%	1%	7%	15%	0%	

\* 2009 for BSE represents first 10 month, for BMFMS first 6 month of the year

**Appendix 3 – Shares' market quota on BSE transaction value**

<b>First 22 shares of BSE (shares with more than 0.50% of the BSE transactions value)</b>			
<b>Percentage of each share on BSE total ...</b>			
<b>Share symbol</b>	<b>No of transactions</b>	<b>No of shares traded</b>	<b>Value of transactions</b>
SIF5	13	7	20
SIF2	9	5	12
TLV	5	3	11
BRD	5	0	10
SIF3	9	5	7
SNP	5	8	6
SIF4	5	3	5
SIF1	5	2	4
EBS	2	0	4
RRC	3	24	3
DAFR	5	9	2
BIO	4	3	2
TGN	1	0	2
BRK	4	3	2
AZO	3	2	1
TEL	1	0	0,91
<b>Total – 16 shares</b>	<b>79</b>	<b>74</b>	<b>91</b>
SCD	1	1	2
ATB	1	1	0,87
COMI	2	1	0,69
FLA	2	7	0,63
BCC	2	2	0,60
AMO	4	10	0,59
<b>Total – 22 shares</b>	<b>90</b>	<b>94</b>	<b>96</b>

<b>Individual share's quota on BSE transaction value</b>	<b>No. of shares</b>	<b>of BSE transactions value. cumulated for the shares included in the interval</b>
more than 20%	1	20.30
between 10 and 19.99%	2	23.30
between 5 and 9.99%	3	22.50
between 1 and 4.99%	10	26.00
Total 16 shares	16	92.10
between 0.5 and 0.99%	6	4.30
between 0.10 and 0.44%	11	2.90
between 0.01 and 0.09%	24	0.68
Less than 0.01%	12	0.02
= 0	1	0
<b>Total</b>	<b>70</b>	<b>100</b>

**Appendix 4 – Share’s percentage in BSE transaction value  
counted over a monthly base**

Share	May	June	July	August	September	October	November
SIF5	17	20	17	21	19	24	20
TLV	6	5	16	14	12	8	18
SNP	9	7	7	5	3	5	10
SIF2	14	11	11	13	12	13	10
SIF3	5	5	7	7	9	7	10
BRD	18	10	9	8	8	11	8
EBS	2	3	5	4	3	4	7
SIF1	4	4	4	4	4	6	5
SIF4	5	5	5	5	5	3	2
RRC	3	4	2	2	5	3	2
<b>Total first 10</b>	<b>84</b>	<b>74</b>	<b>84</b>	<b>84</b>	<b>80</b>	<b>84</b>	<b>92</b>
TGN	2	3	3	1	1	0.9	1
BIO	1	4	2	2	1	2	0.8
BRK	0.6	1	1	3	2	1	0.9
AZO	2	2	1	0.9	0.4	1	0.8
DAFR	0.9	1	0.6	1	3	4	0.6
TEL	1	0.8	1	0.6	1	1	0.3
<b>Total first 16</b>	<b>89</b>	<b>95</b>	<b>91</b>	<b>90</b>	<b>88</b>	<b>93</b>	<b>93</b>
SCD	2	2	0.9	1	4	0.6	0.1
COMI	2	0.3	0.3	0.8	0.6	1	0.2
AMO	0.9	1	1	0.2	0.5	0.3	0.1
FLA	0.1	0.1	1	0.5	1	0.3	0.1
BCC	0.1	0.1	0.2	0.7	1	0.6	0.3
ATB	0.5	3	0.9	0.6	0.3	0.3	0.2
<b>Total initial 22</b>	<b>97</b>	<b>93</b>	<b>97</b>	<b>97</b>	<b>97</b>	<b>97</b>	<b>97</b>
RMAH	0	0	0	0	0	0	1
TRP	2	0.5	0.3	0.2	0.2	0.1	0.1
SNO	0	2	0	0.1	0	0	0
<b>Total first 25 share</b>	<b>98</b>	<b>96</b>	<b>97</b>	<b>97</b>	<b>97</b>	<b>97</b>	<b>99</b>



### Appendix 5 – Share’s percentage in BSE transaction value counted over a weekly base

Share	Week No																							
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
TLV	5%	7%	4%	8%	7%	5%	8%	8%	10%	18%	20%	5%	5%	36%	11%	23%	5%	6%	6%	4%	8%	15%	10%	21%
SIF5	18%	16%	22%	18%	24%	18%	13%	15%	13%	19%	18%	21%	23%	26%	15%	21%	18%	22%	20%	20%	23%	20%	29%	19%
SNP	8%	11%	10%	5%	5%	5%	13%	15%	4%	6%	6%	5%	7%	3%	4%	3%	4%	2%	2%	4%	6%	7%	4%	10%
SIF2	15%	12%	10%	10%	14%	11%	7%	12%	8%	12%	11%	14%	13%	16%	10%	10%	11%	12%	16%	10%	11%	12%	9%	19%
SIF3	4%	6%	3%	3%	6%	9%	6%	5%	7%	8%	7%	6%	9%	7%	5%	11%	10%	9%	9%	7%	8%	5%	3%	8%
BRD	21%	16%	11%	8%	12%	8%	10%	5%	6%	9%	11%	12%	6%	11%	7%	13%	6%	6%	7%	9%	10%	15%	16%	7%
EBS	2%	2%	3%	3%	3%	2%	4%	3%	13%	5%	4%	5%	4%	5%	4%	3%	1%	4%	2%	6%	4%	5%	3%	4%
SIF1	5%	2%	3%	3%	6%	3%	5%	6%	3%	3%	4%	5%	6%	3%	3%	3%	5%	5%	3%	7%	6%	5%	3%	5%
SIF4	3%	7%	5%	5%	4%	5%	5%	3%	3%	5%	6%	6%	6%	3%	4%	4%	5%	5%	6%	3%	3%	4%	4%	3%
TGN	2%	1%	1%	6%	2%	3%	2%	4%	4%	2%	2%	2%		2%	1%	1%	1%	1%	2%	1%	1%	1%	1%	2%
RRC	1%	7%	4%	8%	3%	3%	8%	5%	3%	1%	1%	2%	1%	2%	3%	5%	9%	3%	2%	1%	8%	3%	3%	1%
BRK	1%	1%	1%	1%	1%	2%	1%	1%	1%	1%	1%	1%	6%	2%	2%	1%	1%	1%	2%	3%	1%	1%	2%	1%
BIO	1%	1%	3%	3%	2%	5%	3%	1%	2%	1%	3%	2%	1%	2%	1%	2%	1%	2%	1%	1%	3%	1%	1%	1%
<b>Total first 13</b>	<b>86%</b>	<b>88%</b>	<b>81%</b>	<b>80%</b>	<b>87%</b>	<b>81%</b>	<b>85%</b>	<b>83%</b>	<b>77%</b>	<b>90%</b>	<b>93%</b>	<b>88%</b>	<b>89%</b>	<b>88%</b>	<b>94%</b>	<b>91%</b>	<b>96%</b>	<b>79%</b>	<b>78%</b>	<b>75%</b>	<b>86%</b>	<b>87%</b>	<b>88%</b>	<b>93%</b>
AZO	1%	1%	7%	3%	1%	1%	2%	5%	1%			1%	1%	1%										
BCC								1%					1%	1%	1%				1%	3%	3%	1%		1%
DAFR	2%			1%					1%				1%	1%	1%				1%	3%	1%	1%	2%	1%
TEL	1%			2%	1%	1%	4%	1%	1%	1%		1%	3%	1%	1%	1%		2%	4%	10%	5%	4%	3%	1%
ATB	3%	2%	1%	2%	4%	1%	1%	1%	1%		1%	3%	1%	1%	1%	4%		7%	8%	2%				
COMI	1%	1%	1%	1%	1%	1%	2%	1%	2%	1%	1%	1%	1%	1%	1%	1%	1%	2%	1%	2%	1%	1%	1%	1%
AMO										1%		1%									1%	1%	1%	
SCD																			1%	1%	1%		1%	
FLA						10%																		
<b>Total inial 22</b>	<b>94%</b>	<b>93%</b>	<b>90%</b>	<b>89%</b>	<b>95%</b>	<b>95%</b>	<b>94%</b>	<b>92%</b>	<b>82%</b>	<b>94%</b>	<b>96%</b>	<b>94%</b>	<b>97%</b>	<b>94%</b>	<b>98%</b>	<b>98%</b>	<b>98%</b>	<b>92%</b>	<b>95%</b>	<b>94%</b>	<b>94%</b>	<b>94%</b>	<b>95%</b>	<b>97%</b>
RMAH	1%	1%	1%	2%	2%	1%	2%	3%	3%	1%									1%		1%			
TRP	1%	3%	1%								1%		1%											
SNO						1%															3%		1%	
IMP	2%	3%	3%	4%	1%	1%	1%	2%	3%	2%	1%	2%	1%	1%					1%			2%	2%	1%
OLT									6%	1%		1%							6%	1%			1%	
ALR																								1%
CMP						1%	1%		2%	1%					1%				1%	1%		1%	1%	1%
PTR								1%	2%															
EFO			2%																					
SPCU									1%						2%					2%				
ALT			1%	2%										1%										
VNC						1%																		
CMF				1%																				
MECF			1%																					
<b>Total 37</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>100%</b>	<b>100%</b>	<b>99%</b>	<b>100%</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>99%</b>	<b>98%</b>	<b>99%</b>	<b>100%</b>

### Appendix 6 – Correlation of shares' prices variation

	<i>SIF1</i>	<i>SIF2</i>	<i>SIF3</i>	<i>SIF4</i>	<i>SIF5</i>	<i>BRD</i>	<i>EBS</i>	<i>TLV</i>	<i>SNP</i>	<i>RRC</i>	<i>DAFR</i>	<i>BIO</i>	<i>TGN</i>	<i>BRK</i>	<i>AZO</i>	<i>TEL</i>
SIF1	1															
SIF2	0.6352	1														
SIF3	0.6311	0.8329	1													
SIF4	0.8753	0.6783	0.6403	1												
SIF5	0.8656	0.7038	0.6648	0.8445	1											
BRD	0.5093	0.5879	0.6173	0.4967	0.5546	1										
EBS	0.5319	0.5401	0.5799	0.5176	0.5540	0.6328	1									
TLV	0.2854	0.3830	0.4946	0.2792	0.3487	0.6197	0.4741	1								
SNP	0.2420	0.4972	0.5497	0.2574	0.2765	0.5449	0.4803	0.4621	1							
RRC	0.3997	0.4013	0.4080	0.4484	0.4407	0.4781	0.3231	0.2855	0.3459	1						
DAFR	0.5119	0.5656	0.4648	0.5037	0.5493	0.4529	0.3374	0.1722	0.3657	0.3878	1					
BIO	0.4361	0.5223	0.5392	0.4661	0.4702	0.5448	0.4892	0.2461	0.4803	0.3660	0.4481	1				
TGN	0.5970	0.5195	0.5300	0.5645	0.5719	0.5177	0.5399	0.2777	0.3433	0.3663	0.4729	0.4318	1			
BRK	0.5948	0.6058	0.6135	0.5685	0.6098	0.5096	0.4109	0.2939	0.3900	0.3722	0.5287	0.5868	0.4805	1		
AZO	0.4621	0.4083	0.3473	0.4543	0.5234	0.4347	0.4078	0.2360	0.3264	0.4250	0.4001	0.3417	0.3369	0.4744	1	
TEL	0.4928	0.4154	0.3887	0.4577	0.5036	0.4129	0.5329	0.3274	0.3963	0.2840	0.4272	0.3939	0.4665	0.5437	0.5237	1

### Appendix 7 – Covariance of shares' prices variation

	<i>SIF1</i>	<i>SIF2</i>	<i>SIF3</i>	<i>SIF4</i>	<i>SIF5</i>	<i>BRD</i>	<i>EBS</i>	<i>TLV</i>	<i>SNP</i>	<i>RRC</i>	<i>DAFR</i>	<i>BIO</i>	<i>TGN</i>	<i>BRK</i>	<i>AZO</i>	<i>TEL</i>
SIF1	11.250															
SIF2	7.712	13.104														
SIF3	7.044	10.033	11.074													
SIF4	9.278	7.759	6.734	9.987												
SIF5	10.052	8.821	7.660	9.241	11.988											
BRD	4.208	5.242	5.060	3.867	4.730	6.068										
EBS	5.097	5.585	5.513	4.674	5.481	4.453	8.162									
TLV	2.589	3.749	4.450	2.386	3.265	4.128	3.663	7.312								
SNP	2.632	5.854	5.953	2.647	3.114	4.359	4.466	4.057	10.513							
RRC	4.004	4.336	4.059	4.236	4.551	3.501	2.747	2.281	3.355	8.869						
DAFR	7.304	8.702	6.574	6.740	8.104	4.749	4.111	1.981	5.060	4.922	17.960					
BIO	5.854	7.534	7.142	5.893	6.484	5.301	5.613	2.657	6.122	4.355	7.525	15.887				
TGN	3.285	3.082	2.857	2.923	3.246	2.101	2.540	1.236	1.837	1.802	3.298	2.838	2.693			
BRK	7.393	8.125	7.565	6.657	7.824	4.651	4.349	2.945	4.703	4.123	8.240	8.721	2.930	13.729		
AZO	6.015	5.733	4.487	5.570	7.033	4.154	4.436	2.471	4.118	4.934	6.583	5.185	2.148	6.718	14.844	
TEL	3.390	3.089	2.668	2.966	3.560	2.099	3.158	1.837	2.656	1.750	3.755	3.275	1.589	4.161	4.147	4.271

### Appendix 8 – Correlation and covariance between shares evolution and BSE indexes evolution

<i>Correlation</i>	<i>SIF1</i>	<i>SIF2</i>	<i>SIF3</i>	<i>SIF4</i>	<i>SIF5</i>	<i>BRD</i>	<i>EBS</i>	<i>TLV</i>	<i>SNP</i>	<i>RRC</i>	<i>DAFR</i>	<i>BIO</i>	<i>TGN</i>	<i>BRK</i>	<i>AZO</i>	<i>TEL</i>	<i>BET-XT</i>	<i>BET</i>	<i>BET-C</i>	<i>ROT-X</i>	<i>BET-FI</i>	
BET-XT	0.63	0.64	0.63	0.65	0.67	0.69	0.62	0.45	0.66	0.76	0.62	0.59	0.70	0.65	0.58	0.63	1					
BET	0.65	0.65	0.67	0.65	0.70	0.83	0.69	0.69	0.65	0.65	0.55	0.60	0.64	0.65	0.58	0.62	0.92	1				
BET-C	0.67	0.68	0.70	0.67	0.72	0.84	0.72	0.62	0.65	0.60	0.58	0.62	0.66	0.68	0.60	0.63	0.92	0.97	1			
ROT-X	0.63	0.62	0.67	0.63	0.68	0.82	0.81	0.69	0.63	0.54	0.47	0.57	0.60	0.59	0.56	0.60	0.85	0.96	0.95	1		
BET-FI	0.85	0.85	0.86	0.86	0.90	0.64	0.63	0.39	0.45	0.49	0.57	0.56	0.63	0.66	0.52	0.53	0.75	0.76	0.79	0.75	1	

<i>Covariance</i>	<i>SIF1</i>	<i>SIF2</i>	<i>SIF3</i>	<i>SIF4</i>	<i>SIF5</i>	<i>BRD</i>	<i>EBS</i>	<i>TLV</i>	<i>SNP</i>	<i>RRC</i>	<i>DAFR</i>	<i>BIO</i>	<i>TGN</i>	<i>BRK</i>	<i>AZO</i>	<i>TEL</i>	<i>BET-XT</i>	<i>BET</i>	<i>BET-C</i>	<i>ROT-X</i>	<i>BET-FI</i>	
BET-XT	4.01	4.37	3.95	3.86	4.42	3.21	3.36	2.30	4.05	4.32	4.94	4.48	2.17	4.57	4.23	2.45	3.58					
BET	4.40	4.79	4.54	4.15	4.94	4.13	3.99	3.79	4.31	3.93	4.70	4.87	2.13	4.88	4.54	2.58	3.55	4.12				
BET-C	4.10	4.47	4.23	3.84	4.55	3.74	3.72	3.04	3.87	3.26	4.45	4.44	1.98	4.55	4.19	2.34	3.16	3.59	3.30			
ROT-X	4.40	4.66	4.61	4.16	4.90	4.19	4.83	3.89	4.27	3.32	4.19	4.71	2.06	4.53	4.47	2.56	3.35	4.04	3.57	4.33		
BET-FI	8.93	9.66	8.94	8.57	9.74	4.94	5.64	3.35	4.56	4.58	7.65	7.01	3.22	7.72	6.35	3.41	4.43	4.85	4.52	4.88	9.86	